



A MEASURE OF FINANCIAL STRESS IN HONG KONG FINANCIAL MARKET – THE FINANCIAL STRESS INDEX

Prepared by Matthew S. Yiu, Wai-Yip Alex Ho and Lu Jin
Research Department

Abstract

We construct a monthly composite financial stress index (FSI) and four sub-FSIs using a set of financial variables in order to provide a timely snapshot of contemporaneous stress in the whole financial system and in each of the four market segments in Hong Kong. The FSI is capable of reviewing historical episodes when Hong Kong was under significant financial stress.

JEL Classification Numbers: G10

Keywords: Financial market; Financial stress

Authors' E-Mail Addresses:

msfyiu@hkma.gov.hk, awyho@hkma.gov.hk, ljin@hkma.gov.hk

The views and analysis expressed in this paper are those of the authors, and do not necessarily represent the views of the Hong Kong Monetary Authority.

I. INTRODUCTION

The global financial crisis in 2008 shows that systemic financial stress not only harms the financial system but also impairs the real economy with substantial economic losses. In light of this, developing a timely and synthetic measure of financial stress has become an important exercise in financial stability analysis.

There have been several studies on constructing financial stress index (FSI). For example, Illing and Liu (2006) construct an FSI for Canada and examine a set of financial variables covering the banking sector, equity market, foreign exchange market and debt market. Later, the International Monetary Fund (IMF) (2008, 2009a) closely resemble Illing and Liu and compile FSIs for both advanced economies and emerging economies.

In this note, we develop a composite FSI for the financial system as a whole and four sub-FSIs covering four important financial market segments to gauge the level of financial stress experienced in Hong Kong. The indexes are constructed using a set of monthly financial variables for the period from January 1997 to September 2009. Such continuous-valued indexes enable policymakers to track the varying magnitude and dynamics of financial stress over time.

Section II discusses the set of financial variables selected and how the variables are used to form the FSIs. Section III examines the evolution of the FSIs and Section IV concludes.

II. CONSTRUCTION OF HONG KONG COMPOSITE FSI AND SUB-FSIs

We first construct sub-FSIs for the four market segments of the financial system of Hong Kong including: the equity market, sovereign debt market, foreign exchange market and banking sector. The sub-FSIs are constructed from a set of selected monthly financial variables for the period from January 1997 to September 2009.¹ Each input series is first subtracted from its sample average and then divided by its standard deviation for the purpose of standardisation.

Equity Market Sub-FSI

For the equity market, we calculate the GARCH (1,1) volatility of monthly return of the Hang Seng Index to gauge the risk of the equity market in Hong Kong.

¹ The sources of the data are listed in the Appendix.

The sub-FSI of the segment is taken as the standardised volatility. During a stressful period, the sub-index will rise because of the heightened uncertainty of investors on the fundamental values of the equity market.

Sovereign Debt Market Sub-FSI

The spread between the yields of the 5-year Hong Kong Exchange Fund Note and the 5-year US Treasury Note is selected to capture the sovereign risk of Hong Kong. We standardise the spread to form the sub-index of the segment. The sub-index will surge when the market perceives higher risk in Hong Kong's sovereign debt than that of the US.

Foreign Exchange Market Sub-FSI

The 12-month at-the-money option-implied volatility of HKD/USD exchange rate is chosen for the sub-index of this market segment. Unlike the index in IMF (2009a), we do not use the changes in exchange rate and foreign reserves to measure the stress in the exchange market. Under the Linked Exchange Rate system and the two-sided Convertibility Undertaking arrangement, the movements of the nominal exchange rate of the Hong Kong dollar are limited and do not reflect the magnitude of stress, if any, experienced by the currency. Furthermore, the changes in foreign reserves are complicated by operations other than for monetary purposes.² Instead, we use the option-implied volatility which is forward-looking in nature and reflect the uncertainty of the exchange rate anticipated by the market participants. The implied volatility is standardised to form the sub-index.

Banking Sector Sub-FSI

We use three financial variables including: the TED spread, inverted term spread and banking distress index, to construct the sub-FSI for the segment. The TED spread is defined as the differential between the 3-month HIBOR and the 3-month Hong Kong Exchange Fund Bill yield. It measures credit risk and funding liquidity risk of interbank lending. The inverted term spread is the yield differential between the 3-month Exchange Fund Bill and the 5-year Exchange Fund Note. A positive inverted term spread occurs when the short-term interest rate rises above the long-term interest rate, which implies shortage of short-term liquidity in the banking sector. The banking distress index is a market-based index that measures the fragility of the banking sector.³ It is based on the extended Merton structural credit risk model, in which equity prices, equity volatility and banks' liabilities are used to estimate the multiple default risk of the banking sector. A larger value of the banking distress index indicates higher systemic

² Fiscal surpluses of the HKSAR Government are also part of the foreign reserves in Hong Kong.

³ See Yu, Fung and Tam (2006) for details of the index.

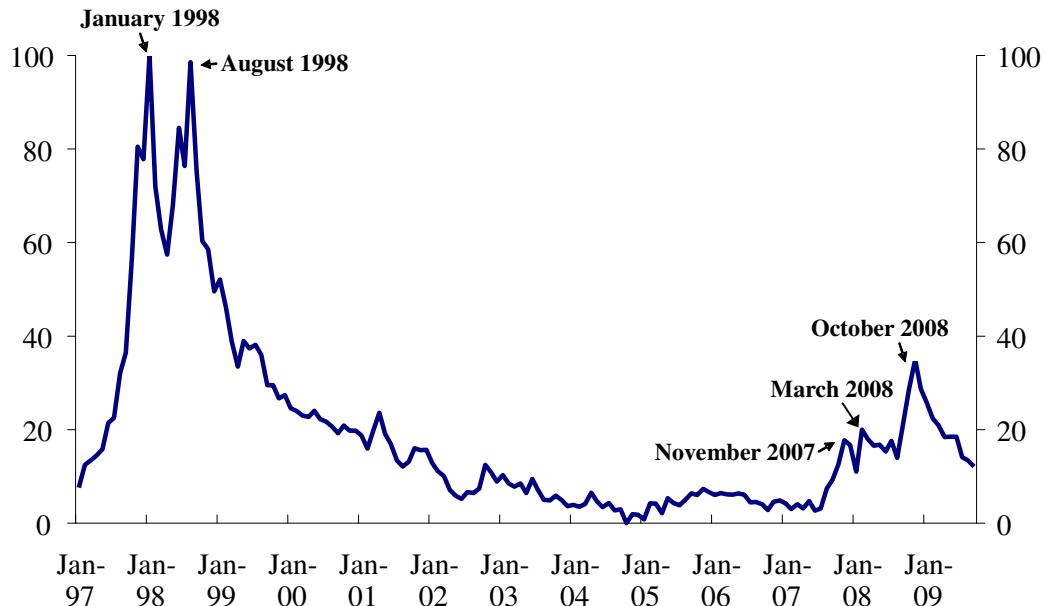
default risk of the banking sector. The sub-FSI for the banking sector is taken as the simple average of the standardised variables.

The composite FSI for the whole financial system of Hong Kong is constructed by taking average of the four sub-FSIs. For better illustration, each sub-FSI is rescaled to a range of 0 to 100 (sample peak is 100 and sample trough is 0).⁴ The higher the value of the index, the more stress there is in the financial sector.

III. EVOLVEMENT OF FINANCIAL STRESS INDEX DURING 1997 TO 2009

An objective of the use of an FSI is to allow policymakers and market practitioners to track the development of stress in a financial system. One simple way to examine the ability of the index in capturing financial distress is to study the evolution of the indexes during the historical periods. In this section, we evaluate the dynamics of the composite FSI and the four sub-FSIs to identify episodes of financial stress graphically and discuss the evolution of financial stress in Hong Kong from January 1997 to September 2009.

Figure 1: Composite financial stress index



⁴ The composite FSI is constructed based on the unscaled sub-FSIs instead of the scaled.

Figure 2: Equity market stress index

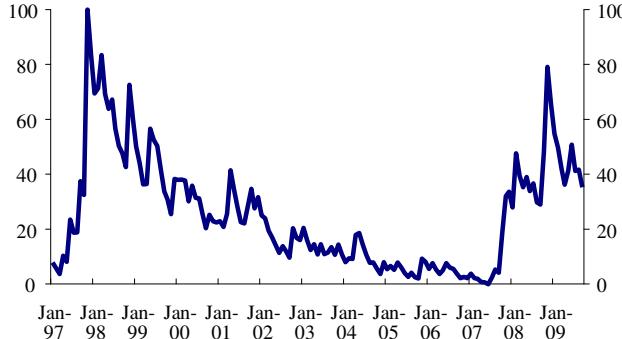


Figure 3: Sovereign debt stress index

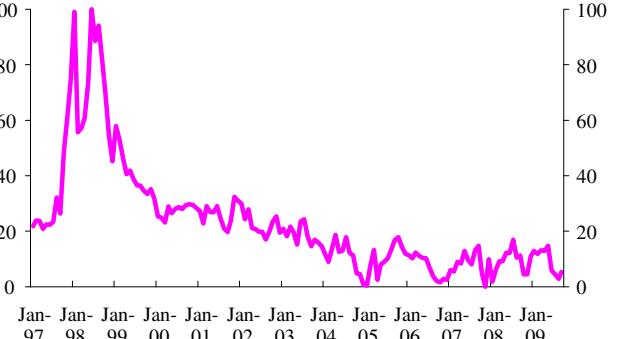


Figure 4: Banking stress index



Figure 5: Foreign exchange stress index

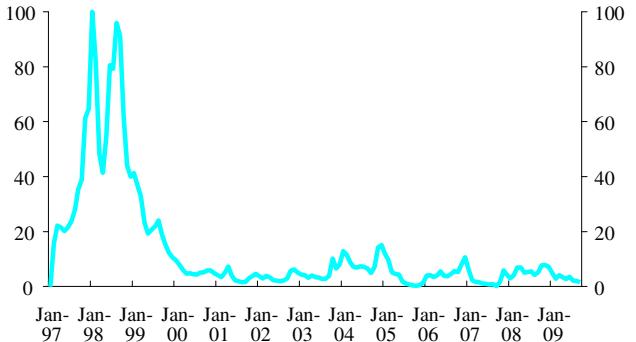


Figure 1 displays the evolution of the composite FSI. As expected, the peaks of the constructed index occurred in the periods of extreme financial stress during the Asian financial crisis. The composite FSI first peaked (rescaled to 100) around the beginning of 1998 and again in mid-1998, when the two waves of speculative attacks hit the currency and equity markets in the region during the crisis. The sub-FSIs revealed further that all the four segments of the financial system of Hong Kong had experienced a high level of stress in the same period (see Figures 2 to 5). When the crisis receded, the composite FSI decreased gradually and remained extremely low in the period from 2003 to mid-2007.

It is worth noting that the sub-FSI of the banking system rose around mid-2005. It was noted by examining the movements of its components, i.e. the banking distress index, the TED spread and the inverted term spread, that the surge was attributable to the increase of the inverted term spread. It was because the yield of the 3-month Exchange Fund Bill returned to a normal level from the very low level beforehand. In the period from 2004 to mid-2005, hot money flooded the Hong Kong banking system because of the speculation of the appreciation of the Hong Kong dollar as a vehicle of speculation on a revaluation of the renminbi, making the short-term yield exceptionally low. However, the establishment of the strong-side Convertibility Undertaking of the Hong Kong dollar in May 2005 reversed the expectation.

The stress on the whole financial system rose sharply first around November 2007 when the sub-prime problem in the US surfaced and rose further in October 2008 after the collapse of Lehman Brothers, as indicated by the sharp increases in the composite FSI in Figure 1. Unlike the Asian financial crisis in 1997 - 1998, the Lehman Brothers incident did not have an impact across the financial system. Significant increases in stress are only observed in the banking system and the equity market while stress in the sovereign debt and foreign exchange markets remained low as shown in Figures 2 to 5.

The composite FSI has declined steadily since the end of 2008. It was mainly due to the returned stability of the banking system and the equity market in the first two quarters of 2009. Supportive measures taken by the HKMA together with ample interbank liquidity induced by the accommodative monetary policy of the US underpinned improvements in the outlook of the banking system.⁵ Because of the increase in volatility of equity prices around mid-2009, the sub-FSI of the equity market has resurged for a short period of time as depicted in Figure 2.

As shown by the composite FSI, financial stress in Hong Kong was well contained in September 2009. Nonetheless, the current alleviation of stress is largely liquidity-driven. The uncertainty on the timing of implementation of exit strategies by central banks of major economies may make the financial sector less stable in the medium-term.

IV. FINAL REMARKS

In this note, we construct a monthly composite FSI and four sub-FSIs for the financial sector in Hong Kong using a set of financial variables for the period from January 1997 to September 2009. The objective of the composite FSI is to provide policymakers with a timely snapshot of contemporaneous stress in the financial system and to help explain market's interpretation of the impact of a shock on overall financial conditions and conditions in each market segments. As suggested by the index, financial stress in Hong Kong was well contained in September 2009.

⁵ See Fung and Yu (2009) for discussions and evidence on the effectiveness of policy measures taken by the HKMA that reduces financial stress in Hong Kong. IMF (2009b) discusses similar issues for emerging economies under ample liquidity generated from unconventional measures taken by the US and several advanced economies.

REFERENCES

Dotsey, M. (1998), The Predictive Content of the Interest Rate Term Spread for Future Economic Growth, Federal Reserve Bank of Richmond, *Economic Quarterly*, Vol. 84 (Summer 1998), pp. 31-50.

Estrella, A. and Mishkin, F. (1998), Predicting U.S. Recessions: Financial Variables as Leading Indicators, *Review of Economics and Statistics*, Vol. 80, pp. 45-61.

Fung, L. and Yu, I.W. (2009), Dislocations in FX Swap and Money Markets in Hong Kong and Policy Actions during the Financial Crisis in 2008, HKMA Working Paper 17/2009.

Illing, M. and Liu, Y. (2006), Measuring Financial Stress in a Developed Country: An Application to Canada, *Journal of Financial Stability*, Vol. 2(3), pp. 243-265.

International Monetary Fund (2008), Chapter 4, Financial Stress and Economic Downturns, World Economic Outlook, October 2008.

International Monetary Fund (2009a), Chapter 4, How Linkages Fuel the Fire: the Transmission of Financial Stress from Advanced to Emerging Economies, World Economic Outlook, April 2009.

International Monetary Fund (2009b), Global Financial Stability Report, September 2009.

Melvin, M. and Taylor, M. (2009), The Crisis in the Foreign Exchange Market, CESifo Working Paper No. 2707.

Yu, I.W., Fung, L. and Tam, C.S. (2006), Assessing the Risk of Multiple Defaults in the Banking System, HKMA Research Memorandum 06/2006.

APPENDIX: DATA AND SOURCES

Variables	Definitions	Sources
TED spread	3-month HIBOR minus 3-month Hong Kong Exchange Fund Bill rate	Bloomberg
Inverted term spread	3-month Exchange Fund Bill yield minus 5-year Exchange Fund Note yield	Bloomberg
Banking distress index	Multiple default risk of banking sector in Hong Kong	Bloomberg and HKMA staff estimates
Time varying volatility of exchange rate	12-month at-the-money option implied volatility of HKD/USD exchange rate	JP Morgan
Time varying volatility of stock return	GARCH (1,1) volatility of monthly return of Hang-Seng index	Bloomberg and HKMA staff estimates
Sovereign risk spread	5-year Hong Kong Exchange Fund Note yield minus 5-year US Treasury Note yield	Bloomberg